

## Education and Human Resources

ED11A MC: 121 Monday 0830h

**Strategies Which Foster Broad Use and Deployment of Earth and Space Science Informal and Formal Education Resources I** (joint with P, T, PA)

**Presiding:** R Gabrys, NASA Goddard Space Flight Center; F Ireton, SSAI; B Meeson, NASA Goddard Space Flight Center

ED11A-01 0835h

**What Makes Earth and Space Science Sexy? A Model for Developing Systemic Change in Earth and Space Systems Science Curriculum and Instruction**

Rochelle L. Slutskin (410-222-5451; rtshelli@clark.net)

Anne Anne Arundel County Public Schools, 2644 Riva Road, Annapolis, MD 21401, United States

Earth and Space Science may be the neglected child in the family of high school sciences. In this session, we examine the strategies that Anne Arundel County Public Schools and NASA Goddard Space Flight Center used to develop a dynamic and highly engaging program which follows the vision of the National Science Education Standards, is grounded in key concepts of NASA's Earth Science Directorate, and allows students to examine and apply the current research of NASA scientists.

Find out why Earth/Space Systems Science seems to have usurped biology and has made students, principals, and teachers clamor for similar instructional practices in what is traditionally thought of as the "glamorous" course.

URL: <http://education.gsfc.nasa.gov/aacps/>

ED11A-02 0850h

**Project ALERT: Three Years Of A Catalytic Partnership For Improving Pre-Service Teacher Education In Earth System Sciences**

Elizabeth L Ambos<sup>1</sup> ((562)-985-4931; bambos@csulb.edu); Edward W Ng<sup>2</sup> (Edward.W.Ng@jpl.nasa.gov); Ellen P Metzger<sup>3</sup> (metzger@geosun1.sjsu.edu); Jay W Skiles<sup>4</sup> (jwskiles@mail.arc.nasa.gov); Gerry Simila<sup>5</sup> (gsmila@csun.edu); Newell Garfield<sup>6</sup> (garfield@sfsu.edu)

<sup>1</sup> California State University at Long Beach, 1250 Bellflower Boulevard, Long Beach, CA 90840

<sup>2</sup> Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, CA

<sup>3</sup> San Jose State University, One Washington Square, San Jose, CA 95192

<sup>4</sup> Ames Research Center, SETI Institute M.S 239-20, Moffett Field, CA

<sup>5</sup> California State University at Northridge, 18111 Nordhoff Street, Northridge, CA 91330

<sup>6</sup> San Francisco State University, 1600 Holloway Avenue, San Francisco, CA 94132

During the last three years, a California-based partnership for improving earth science education and outreach has grown between ten California State University (CSU) campuses, and two NASA centers in California, Ames Research Center (ARC), and the Jet Propulsion Laboratory (JPL). This partnership, Project ALERT (Augmented Learning Environment and Renewable Teaching) has had as its main goal the improvement of earth system science education for pre-service teachers, with particular focus on urban northern and southern California regions. Objectives associated with this goal have included evaluating and using existing NASA earth system science educational materials, creating new materials as needed, and linking CSU earth science and science education professors with NASA earth scientists and outreach and technology specialists through cooperative research and education projects. Strategies to develop the regional partnership include providing summer faculty fellowships

at JPL and ARC for CSU professors and NASA scientists and outreach and education specialists, with supplementary funding for CSU professors and workshops involving CSU and NASA center personnel during the academic year. Highlights of the last three years of ALERT include: (1) the formation of new, "spin-off" projects that address curriculum reform and in-service teacher education in the earth system sciences, or digital library issues, (2) creation of a shared web site and resources for university-level introductory earth system science instruction (<http://projectalert.nasa.gov>), (3) evaluation and, in some instances, improvement of existing NASA-generated instructional materials, (4) intensified interest on the part of CSU faculty in education issues, leading to policy roles on respective CSU campuses, (5) modification and/or creation of more than six courses specifically incorporating earth system science into pre-service teacher education, and, (6) heightened awareness of educational and digital library issues on California NASA campuses. As the ALERT partnership continues to evolve, powerful lessons concerning the cumulative effects of forming state-based educational partnerships continue to be learned. These lessons will be shared in this presentation, as well as the potential pitfalls to partnership growth and sustainability.

URL: <http://projectalert.nasa.gov>

ED11A-03 0905h

**Partner with the Experts: The EOS Aura Education and Public Outreach Strategy**

Stephanie Stockman (301-614-6457; stockman@core2.gsfc.nasa.gov)

SSAI, NASA Goddard Space Flight Center, Code 921 NASA/GSFC, Greenbelt, MD 20771, United States

One of the challenges faced by NASA satellite missions is the creation and distribution educational and public outreach (EPO) material with a limited amount of funding. This paper will detail the approach developed to support EOS Aura, a four-instrument atmospheric chemistry satellite that will launch in 2003. The mission focuses on collecting data to help answer three major science questions: Is the Earth's ozone layer recovering? Is air quality getting worse? How is Earth's climate changing? The Aura project has created several strategic partnerships within the formal and informal education communities that facilitate the development and dissemination of materials to foster the understanding of the Aura mission and its major science questions.

Partners and programs include the American Chemical Society ChemMatters magazine, the Smithsonian Institution National Museum of Natural History "Forces of Change" program, and the GLOBE Program. Each of the Aura EPO collaborations is built around pre-existing programs within the partner organizations. The partner organizations bring formal and informal education expertise, pre-existing education products, networks of educators, and large target audiences to the Aura EPO program. The Aura mission provides funding, science and technological expertise, materials created for the mission such as physical models and scientific visualizations, as well as access to NASA's nationwide education network. The goal is to leverage limited EPO resources to reach educators, students and the public through a variety of mechanisms. This talk will highlight projects that have resulted from the Aura EPO strategic partnerships.

ED11A-04 0920h

**Linking Science and Society With an Environmental Information Bridge**

Leigh Welling<sup>1</sup> (701-777-2503; lwelling@aero.und.edu)

George Seielstad<sup>1</sup> (701-777-4755; gseielst@aero.und.edu)

Dave Jones<sup>2</sup> (410-647-4299; dave@stormcenter.com)

Jane Peterson<sup>1</sup> (701-777-4932; janep@aero.und.edu)

<sup>1</sup> University of North Dakota, John D. Odegard School of Aerospace Sciences PO Box 9007, Grand Forks, ND 58202-9007, United States

<sup>2</sup> StormCenter.com, Inc., 265 Lower Magothy Beach Road, Severna Park, MD 21146-2118, United States

Building learning communities to engage the public in identifying and solving local and regional environmental problems is the vision of the newly created Northern Great Plains Center for People and the Environment at the University of North Dakota. The Center serves as an Environmental Information Bridge between science and society for citizens of the region, providing information, data, and value-added remote sensing products to precision agriculture, sustainable forestry, Native American land managers, and K-lifetime educators. Guided by the needs of end users, the new Center is a prototype for a national infrastructure that meets

ESEs objective to expand and accelerate the realization of economic and societal benefits from Earth science, information, and technology. The scientific community has been good at converting raw data into useful information. However, a serious communications gap exists between the communities of scientists and non-scientists. The new Center bridges this gap, creating a many-to-many exchange of information among those who learn first about the environment and those who will put those lessons to work for their economic welfare, the betterment of the quality of their lives, and the benefit of their descendants.

A major outreach component of the Center, written and produced at UND, is Our Changing Planet, a public television series aimed at increasing viewers awareness of environmental and climate change issues. Now carried by approximately 30 public television stations the series is distributed nationwide by the National Education Television Association. The Center has also recently established a partnership with StormCenter.com, LLC, a multimedia company and fellow partner in NASA's Federation of Earth Science Information Partners that uses leading-edge technology to deliver information about the environment to regional television stations. Service to the media provides a vital link between science and the public, as local weather broadcasts are often the public's primary source of environmental news and information. Through our partnership with StormCenter.com, the Northern Great Plains Center for People and the Environment will deliver up-to-date satellite imagery and accurate environmental information to regional media outlets.

ED11A-05 0935h

**Assessing the Effectiveness of Inquiry-based Learning Techniques Implemented in Large Classroom Settings**

David N Steer<sup>1</sup> (330-972-2099; steer@uakron.edu)

David A McConnell<sup>1</sup> (330-972-8047; dam6@uakron.edu)

Katherine Owens<sup>2</sup> (330-972-7437; kowens@uakron.edu)

<sup>1</sup> Geology Department, The University of Akron, Akron, OH 44325-4101, United States

<sup>2</sup> Department of Curricular and Instructional Studies, The University of Akron, Akron, OH 44325-4205, United States

Geoscience and education faculty at The University of Akron jointly developed a series of inquiry-based learning modules aimed at both non-major and major student populations enrolled in introductory geology courses. These courses typically serve 2500 students per year in four to six classes of 40-160 students each per section. Twelve modules were developed that contained common topics and assessments appropriate to Earth Science, Environmental Geology and Physical Geology classes. All modules were designed to meet four primary learning objectives agreed upon by Department of Geology faculty. These major objectives include: 1) Improvement of student understanding of the scientific method; 2) Incorporation of problem solving strategies involving analysis, synthesis, and interpretation; 3) Development of the ability to distinguish between inferences, data and observations; and 4) Obtaining an understanding of basic processes that operate on Earth. Additional objectives that may be addressed by selected modules include: 1) The societal relevance of science; 2) Use and interpretation of quantitative data to better understand the Earth; 3) Development of the students' ability to communicate scientific results; 4) Distinguishing differences between science, religion and pseudo-science; 5) Evaluation of scientific information found in the mass media; and 6) Building interpersonal relationships through in-class group work.

Student pre- and post-instruction progress was evaluated by administering a test of logical thinking, an attitude toward science survey, and formative evaluations. Scores from the logical thinking instrument were used to form balanced four-person working groups based on the students' incoming cognitive level. Groups were required to complete a series of activities and/or exercises that targeted different cognitive domains based upon Bloom's taxonomy (knowledge, comprehension, application, analysis, synthesis and evaluation of information). Daily assessments of knowledge-level learning included evaluations of student responses to pre- and post-instruction conceptual test questions, short group exercises and content-oriented exam questions. Higher level thinking skills were assessed when students completed exercises that required the completion of Venn diagrams, concept maps and/or evaluation rubrics both during class periods and on exams.

Initial results indicate that these techniques improved student attendance significantly and improved overall retention in the course by 8-14% over traditional lecture formats. Student scores on multiple choice exam questions were slightly higher (1-3%) for students taught in the active learning environment and short answer questions showed larger gains (7% over students' scores in a more traditional class structure.

## ED11A-06 0950h

**Phytopia: Showcasing Tiny Ocean Life in a Multimedia Environment**

Cynthia Hall Atkinson<sup>1</sup> (818.354.9017;  
Cynthia.H.Atkinson@jpl.nasa.gov)

Annette deCharon<sup>2</sup> (adecharon@bigelow.org)

Michael Sieracki<sup>2</sup> (msieracki@bigelow.org)

Stephan Zeeman<sup>3</sup> (SZeeman@Mailbox.une.edu)

<sup>1</sup>Jet Propulsion Laboratory/California Institute of Technology, 4800 Oak Grove Drive Mailstop: 171-264, Pasadena, CA 91109, United States

<sup>2</sup>Bigelow Laboratory for Ocean Sciences, PO Box 475, West Boothbay Harbor, ME 04575, United States

<sup>3</sup>University of New England, Department of Life Sciences 11 Hills Beach Road, Biddeford, ME 04005, United States

Phytopia is an educational CD-ROM now being developed by the Bigelow Laboratory for Ocean Sciences, the University of New England, and the Data Distribution Laboratory at NASA's Jet Propulsion Laboratory. This multimedia educational experience brings the lower end of the marine food web "to life," promoting interaction with multimedia tools that enable students to discover why the marine ecosystem is critical to human existence. This product provides a window to the fascinating world of the oceans' microscopic plant life which, before Phytopia, only scientists saw.

The core technology of Phytopia is a first-ever searchable database of many important phytoplankton from the world's temperate oceans: "The Phyto Files." Also included in The Phyto Files module are three-dimensional phytoplankton models and a virtual microscope tool, which allows for the viewing of phytoplankton at various magnifications, under various epifluorescence techniques, and by scanning electron microscopy. In the future, we will develop two additional modules: "The Phyto Factors" and "Special Topics." The Phyto Factors module will contain engaging interactive interfaces in which users can alter environmental conditions to see how changes in these factors affect the chlorophyll content and species composition of the upper ocean. The elements heretofore described provide the foundation needed for students to truly envision and grasp the marine food web. With this background, they can explore many interesting and relevant subjects, such as harmful algal blooms, in the Special Topics module. The culmination of these three modules will be a truly hybrid product benefiting both research and education.

## ED11A-07 1025h

**The Blueprint for Change: A National Strategy to Enhance Access to Earth and Space Science Education Resources**

Edward E Geary<sup>1</sup> (970-491-1700;  
egeary@csmate.colostate.edu)

Daniel Barstow<sup>2</sup> (617-547-0430;  
dan@barstow@terc.edu)

<sup>1</sup>Colorado State University, CSMATE B301 NESB, Ft. Collins, CO 80523, United States

<sup>2</sup>TERC, CESSE 2067 Massachusetts Ave., Cambridge, MA 02140, United States

Enhancing access to high quality science education resources for teachers, students, and the general public is a high priority for the earth and space science education communities. However, to significantly increase access to these resources and promote their effective use will require a coordinated effort between content developers, publishers, professional developers, policy makers, and users in both formal and informal education settings. Federal agencies, academic institutions, professional societies, informal science centers, the Digital Library for Earth System Education, and other National SMETE Digital Library Projects are anticipated to play key roles in this effort.

As a first step to developing a coordinated, national strategy for developing and delivering high quality earth and space science education resources to students, teachers, and the general public, 65 science educators, scientists, teachers, administrators, policy makers, and business leaders met this June in Snowmass, Colorado to create "Earth and Space Science Education 2010: A Blueprint for Change". The Blueprint is a strategy document that will be used to guide Earth and space science education reform efforts in grades K-12 during the next decade. The Blueprint contains specific goals, recommendations, and strategies for coordinating action in the areas of: Teacher Preparation and Professional Development, Curriculum and Materials, Equity and Diversity, Assessment and Evaluation, Public Policy and Systemic Reform, Public and Informal Education, Partnerships and Collaborations, and Technology. If you develop, disseminate, or use exemplary earth and space science education resources, we

invite you to review the Blueprint for Change, share it with your colleagues and local science educators, and join as we work to revolutionize earth and space science education in grades K-12.

## ED11A-08 1040h INVITED

**Sharing Planetary Science on a Regional Scale**

Cassandra R. Runyon<sup>1</sup> (843.953.8279;  
runyon@cofc.edu)

Mitchell Colgan<sup>1</sup> (843.953.7171;  
mcolgan@loki.cofc.edu)

<sup>1</sup>College of Charleston, 66 George Street Department of GEOLOGY/SERCH, Charleston, SC 29424

Fifteen southeastern Space Grant Consortia (AL, AK, DL, DC, FL, GA, KY, LA, MD, Mississippi, NC, PR, SC, TN, VI, VA) have joined together to form the Office of Space Science (OSS) Southeastern Regional Clearing House, or SERCH. The objectives of SERCH are to produce a network of science educators and OSS scientists, to assess the regions educational needs and strengths, and to tailor OSS education material and data to the need of the southeastern educators and students. SERCH serves as a facilitator and broker of services by a two-way interface between the southeastern region's diverse educational community and national scientists and engineers involved in OSSs flight missions and research programs. Our goal is to make SERCH a one-stop educational service center for the science, mathematics and technology educators needing OSS material and OSS scientists needing help in developing educational material. We promote the development of partnerships among educators and scientists to accomplish the educational and outreach missions of the OSS. These partnerships create and sustain educational programs that are effective, locally useful, yet national in scope. Our strategies include respecting the diversity of our audiences, listening to their needs and working closely with both the product developers and end-users to ensure that the materials and resources are effective, scientifically correct and fun to use.

URL: <http://serch.cofc.edu/serch>

## ED11A-09 1055h

**Earth Science Education and the Girl Scouts USA**

Arlene S. Levine (757-864-3318;  
a.s.levine@larc.nasa.gov)

Atmospheric Sciences Competency, NASA Langley Research Center, Hampton, VA 23681-2199

Women are an under-represented population in the physical sciences and engineering, including the Earth sciences. In order to enhance interest and understanding of the Earth sciences in young girls, the Atmospheric Sciences Program at the NASA Langley Research Center, in partnership and cooperation with the Girl Scouts USA and individual Girl Scout Councils, have developed a series of Earth science workshops for Girl Scout trainers and leaders. The workshops cover the Earth system, including the atmosphere, the hydrosphere, the lithosphere, and the biosphere and the interactions between the various components of the system. The workshop lectures are presented by NASA and university scientists. Each workshop includes hands-on demonstrations and experiments that can be performed by the Girl Scouts. The workshops are presented both at the NASA Langley Research Center and at the Girl Scout USA Conference Center in Briarcliff, New York. The workshop format, content and demonstrations will be discussed.

## ED11A-10 1110h

**Strategies used by GLOBE to Study the Environment**

Ian D. MacGregor (202-501-2998;  
imacgregor@globe.gov)

GLOBE Program, Suite 800, 1800 G st., NW, Washington, DC 20006, United States

The goals of GLOBE Program are to enhance the environmental awareness of individuals throughout the world, contribute to scientific understanding of the Earth, and help all students reach higher levels of achievement in science and mathematics. To achieve these goals GLOBE uses a number of strategies. The fundamental strategy is to help schools install environmental observatories and the associated technologies needed to quantify the environment. Under the supervision of their teachers, students collect scientifically useful environmental data. A critical component is to improve the motivation and seriousness of students by including them as partners in real science. GLOBE has selected researchers who use the student's data, define the protocols for data acquisition, and are readily accessible to interact with students. This network of

college and university professors is one of the core resources available to students.

A second strategy has been to facilitate communication among students throughout the world. Web-based technologies now allow for rapid communication, access to global data, and enables students, teachers and scientists to function as distributed research teams. The Web also provides a useful resource of readily available research tools to work with and present the data.

An essential element of the GLOBE strategy is to train teachers to use GLOBE equipment, make measurements, and use environmental data to enhance their science curricula. GLOBE provides teachers with resources such as texts, instruments, professional training, and help on demand.

The different strategies combine to help students make their own independent measurements and through student inquiry become active members of the scientific community.

URL: <http://www.globe.gov>

## ED11A-11 1125h

**User-based Resource Design in Earth Science Education**

Michael Luby<sup>1</sup> (212 851 2961;  
ml1047@columbia.edu)

John Haber<sup>1</sup> (212 851 2962; jh624@columbia.edu)

Kate Wittenberg<sup>1</sup> (212 854 0167;  
kw49@columbia.edu)

<sup>1</sup>Columbia University Press/ Electronic Publishing Initiative at Columbia, 610 Butler Library Columbia University 535 West 114th Street, New York, NY 10027, United States

Reform in the classroom, and certainly in academic publishing, is greatly influenced not only by educational research, but also by direct surveys of students and instructors. This presentation looks at changes to Columbia Earthscape, [www.earthscape.org](http://www.earthscape.org), based on an ongoing series of evaluation and testing measures. Two years ago, the Earthscape project was introduced as a central online resource. It aimed to select and make available authoritative materials from all the disciplines that constitute Earth-system science. Its design harnessed the dynamics of the Web and the interrelatedness of research, education, and public policy. In response to substantial class tests, involving five universities in the United States and abroad, three focus groups of geoscience faculty and librarians, user feedback, internal editorial-board review, and extensive consultation with colleagues in commercial and nonprofit educational publishing, Earthscape is implementing broad changes in design and content. These include arranging the site into sections that correspond to user profiles (scientist, policy-maker, teacher, and student), providing easier search or browsing (by research area, policy content, or lesson concept), and streamlining the presentation of links among our resources. These changes are implemented through more advanced searching capabilities, greater specificity of content metatags, and an overall increase in content from journals, books, and original material. The metatags now include all core geoscience disciplines or a range of pertinent issues (such as climate change, geologic hazards, and pollution). Reflecting the evaluation by librarians, Earthscape's revised interface will permit users to begin with a primary area of interest based on who they are, their "profile." They can then either browse the site's entire holdings in that area, perform searches within each area, or follow the extensive hyperlinks to explore connections to other areas and user needs. Another two focus groups consisting of undergraduate geoscience teaching faculty brought about a rearrangement of hyperlinked resources within course-module pages. This involved less-cluttered hot-linking in running text and uniform lists of video and images links and research links at the end of all modules. Finally, after analyzing the results of a survey questionnaire administered to hundreds of students, we increased and revised content metatags to produce more specific search returns and redistributed lists of annotated links throughout the site. We are also continuing to seek more full-text content, including original student research and exposition.

URL: <http://www.earthscape.org>

## ED11A-12 1140h

**New Dimensions of Discovery About Earth and Space Science Using the Digital Library for Earth System Education (DLESE)**

David W. Mogk<sup>1</sup> (406 994-6916;  
mogk@montana.edu)

Cathryn A. Manduca<sup>2</sup> (507 252-8658;  
cmanduca@carleton.edu)

<sup>1</sup>Dept. of Earth Sciences, Montana State University, Bozeman, MT 59717, United States

<sup>2</sup>Carleton College Carleton College, Teaching and Learning Center, Northfield, MN 55057

The mission of DLESE is to support excellence in Earth and space science education for all learners in all educational settings. DLESE is envisioned as an information network that will provide a) rapid, sophisticated access to collections of peer-reviewed teaching and learning resources, b) interfaces and tools to allow student exploration of Earth data sets, c) services to help users effectively create and use materials, and d) a community center to facilitate sharing and collaboration. The current DLESE discovery system enables searching and browsing for educational resources according to sub-disciplines in the Earth and space sciences, target audience (K-16, informal education), and resource type (e.g. lab exercises, simulations, curricula...). Future search capabilities will include compliance of resources with national science standards (e.g. National Science Education Standards, NRC, 1996; Project 2061, AAAS, 1989; state standards) and geospatial referencing. A special focus is being placed on discovery that describes multiple attributes of the Earth system: fundamental scientific principles, Earth system processes, Earth system components (physiographic, climatologic, biomes), principles of time and Earth history, hot topics in the news and emerging research, and ways of knowing about the Earth (observation, analysis, measurement, modeling, theory). Earth datasets will become increasingly accessible, supported by interfaces, tools, and instructional resources that promote their effective use in the classroom. Instructional resources can also be linked to examples of best practices in the use of these resources, and to community postings of opportunities (e.g. workshops, student internships), calendars, and other aggregated resources. Through the DLESE discovery system, any interested learner will be able to navigate deeply into a subject, or laterally to related topics, according to personal needs and interests.

URL: <http://www.dlese.org>

## ED12A MC: Hall D Monday 1330h

**Strategies Which Foster Broad Use and Deployment of Earth and Space Science Informal and Formal Education Resources II** (*joint with P, T, PA*)

**Presiding:** R Gabrys, NASA Goddard Space Flight Center; F Ireton, SSAI; B Meeson, NASA Goddard Space Flight Center

## ED12A-0156 1330h POSTER

**Using Food to Demonstrate Earth Science Concepts**

Jessica Walter<sup>1</sup> (989 774 7617; [walterjd@cmich.edu](mailto:walterjd@cmich.edu))

Mark Francek<sup>1</sup> (989 774 7617; [Mark.Francek@cmich.edu](mailto:Mark.Francek@cmich.edu))

<sup>1</sup>Central Michigan University, Department of Geography and Earth Science, Mount Pleasant, MI 48859, United States

One way to better engage K-16 students with the earth sciences is through classroom demonstrations with food. We summarize references from journals and the world wide web that use food to illustrate earth science concepts. Examples of how edible substances have been used include using candy bars to demonstrate weathering concepts, ice cream to mimic glaciers, and grapes to demonstrate evaporation. We also categorize these demonstrations into geology, weather, space science, and oceanography categories. We further categorize the topics by grade level, web versus traditional print format, amount of time necessary to prepare a lesson plan, and whether the activity is better used as a demonstration or hands on activity.

## ED12A-0157 1330h POSTER

**The Development of a Climate Time Line Information Tool**

Dan Kowal<sup>1</sup> (303-497-6118; [dan.kowal@noaa.gov](mailto:dan.kowal@noaa.gov))

Mark McCaffery<sup>1</sup> (303-497-6939; [Mark.McCaffery@noaa.gov](mailto:Mark.McCaffery@noaa.gov))

Dr. David Anderson<sup>1</sup> (303-497-6237; [david.m.anderson@noaa.gov](mailto:david.m.anderson@noaa.gov))

Dr. Ray E. Habermann<sup>1</sup> (303-497-6472; [Ted.Habermann@noaa.gov](mailto:Ted.Habermann@noaa.gov))

<sup>1</sup>NGDC, NOAA, E/GC1 325 Broadway, Boulder, CO 80305-3328, United States

The "Climate Time Line" or CTL tool currently in development at the National Geophysical Data Center will provide a climatic and "place-based" context for current weather patterns and a pre-instrumental context for current climate trends. Two audiences-GLOBE students and water managers involved with the Western Water Assessment-are targeted in the pilot project phase to test the CTL as a learning and decision-making support tool. Weather, climate and paleoclimatic observations will be integrated through a web-based interface that can be used for comparing data collected over 10 year, 100 year and 1000+ year periods, and made accessible and meaningful to non-technical users.

The Climate Time Line prototype will include the following features: 1) Access to diverse data sets such as NCDC's Historic Climate Network, GLOBE Student Data Archive, World Data Center for Paleoclimatology and historical streamflow data from the USGS; 2) Map Locator/Search Utility for regional inquiries and comparison views; 3) Varying temporal and spatial displays; 4) Tutorial and help sections to guide and support users; 5) Supporting materials including a "Powers of Ten" primer examining variability at various timescales; and 6) Statistical assessment tools.

The CTL prototype offers a novel approach in the scientific analysis of climate and hydrology data. It will facilitate inquiries by simplifying access to environmental data. Additionally, it will provide historical timelines for the intended user to compare the development of human cultures in relation to climate trends and variability-promoting an inquiry-rich learning environment. Throughout the pilot project phase, the CTL will undergo evaluation particularly in the area of usability, followed by a pre- and post- assessment of its educational impact on the targeted, non-technical audience. A hypernews workspace has been created to facilitate the development of the CTL.

URL: <http://HyperNews.ngdc.noaa.gov/HyperNews/get/ClimateTimelineProject.html>

## ED12A-0158 1330h POSTER

**Cooperative Educational Project - The Southern Appalachians: A Changing World**

Sandra Clark<sup>1</sup> (703-648-6115; [shbclark@usgs.gov](mailto:shbclark@usgs.gov))

Judith Back<sup>1</sup> (703-648-6459; [jback@usgs.gov](mailto:jback@usgs.gov))

Anne Tubiolo<sup>2</sup> (304-535-6131; [AnneTubiolo](mailto:AnneTubiolo))

Elizabeth Romanau<sup>3</sup> ([romanau@alum.wellesley.edu](mailto:romanau@alum.wellesley.edu))

<sup>1</sup>U.S. Geological Survey, 954 National Center, Reston, VA 20192, United States

<sup>2</sup>National Park Service, Harpers Ferry Center Fillmore Street, Harpers Ferry, WV, United States

<sup>3</sup>Liberty Science Center, Liberty State Park, Jersey City, NJ 08305, United States

The Southern Appalachian Mountains, a popular recreation area known for its beauty and rich biodiversity, was chosen by the U.S. Geological Survey as the site to produce a video, booklet, and teachers guide to explain basic geologic principles and how long-term geologic processes affect landscapes, ecosystems, and the quality of human life. The video was produced in cooperation with the National Park Service and has benefited from the advice of the Southern Appalachian Man and Biosphere Cooperative, a group of 11 Federal and three State agencies that works to promote the environmental health, stewardship, and sustainable development of the resources of the region. Much of the information in the video is included in the booklet. A teachers guide provides supporting activities that teachers may use to reinforce the concepts presented in the video and booklet.

Although the Southern Appalachians include some of the most visited recreation areas in the country, few are aware of the geologic underpinnings that have contributed to the beauty, biological diversity, and quality of human life in the region. The video includes several animated segments that show paleogeographic reconstructions of the Earth and movements of the North American continent over time; the formation of the Ocoee sedimentary basin beginning about 750 million years ago; the collision of the North American and African continents about 270 million years ago; the formation of granites and similar rocks, faults, and geologic windows; and the extent of glaciation in North America. The animated segments are tied to familiar public-access localities in the region. They illustrate geologic processes and time periods, making the geologic setting of the region more understandable to tourists and local students. The video reinforces the concept that understanding geologic processes and settings is an important component of informed land management to sustain the quality of life in a region.

The video and a teachers guide will be distributed by the Southern Appalachian Man and Biosphere to local middle and high schools, libraries, and visitors centers in the region. It will be distributed by the U.S. Geological Survey and sold in Park Service and Forest Service gift shops in the region.

## ED12A-0159 1330h POSTER

**Using NASA's Global Change Master Directory as part of an Earth Science Curriculum**

Heather M. Weir<sup>1</sup> (301-867-2083; [hweir@gcmd.nasa.gov](mailto:hweir@gcmd.nasa.gov))

Stephanie M. Leicester<sup>1</sup> (607-527-9963; [sleicest@gcmd.gsfc.nasa.gov](mailto:sleicest@gcmd.gsfc.nasa.gov))

<sup>1</sup>SSAI/GCMD, 10210 Greenbelt Road Suite 500, Lanham, MD 20706, United States

NASA's Global Change Master Directory (GCMD) (<http://gcmd.nasa.gov>) provides tools for educators, students, and the general public to expand their knowledge of Earth science. Earth science data sets relevant to global change research may be located using the GCMD's free text and science keyword search interfaces. The complex issues of global warming and global climate change encompass all of the Earth science disciplines and demand authoritative information and data. Many data sets from federal agencies, including NASA and NOAA, university projects and research institutes are readily available on-line for downloading. They could prove useful in curriculum development for classroom instruction to illustrate, visualize, and manipulate data. In addition to searching for data sets, users can also search for educational resources such as Earth science curriculum material and software packages. These resources aid educators in accessing and evaluating Earth science data for their curriculum. Educators can also find resources that can be used in the classroom for illustrating, visualizing, and manipulating data.

URL: <http://gcmd.nasa.gov>

## ED12A-0160 1330h POSTER

**The Yohkoh Public Outreach Project: A Space Science Resource for Formal and Informal Education**

James R Lemen<sup>1</sup> ((650) 354-5378;

[lemen@lmsal.com](mailto:lemen@lmsal.com)); David Alexander<sup>1</sup> ((650) 424-2047; [alexander@lmsal.com](mailto:alexander@lmsal.com)); Thomas R

Metcalfe<sup>1</sup> ([metcalf@lmsal.com](mailto:metcalf@lmsal.com)); Sam L Freeland<sup>1</sup>

([freeland@lmsal.com](mailto:freeland@lmsal.com)); Loren W Acton<sup>2</sup>

([acton@mithra.physics.montana.edu](mailto:acton@mithra.physics.montana.edu)); Michelle

Larson<sup>3</sup> ([michelle@ssl.berkeley.edu](mailto:michelle@ssl.berkeley.edu)); David

McKenzie<sup>2</sup>

([Mckenzie@mithra.physics.montana.edu](mailto:Mckenzie@mithra.physics.montana.edu)); Tim

Slater<sup>4</sup>

<sup>1</sup>Lockheed Martin Solar and Astrophysics Lab., Org. L9-41, B/252 3251 Hanover St, Palo Alto, CA 94304, United States

<sup>2</sup>Montana State University, Department of Physics Montana State University, Bozeman, MT 59717, United States

<sup>3</sup>University of California Berkeley, Space Sciences Laboratory UC Berkeley, Berkeley, CA 94720, United States

<sup>4</sup>University of Arizona, Dept. of Astronomy University of Arizona, Tucson, AZ 85721, United States

The Yohkoh Public Outreach Project (YPOP) is a NASA-funded web site maintained by scientists and educators at Lockheed Martin Solar and Astrophysics Lab. and Montana State University. YPOP includes a range of activities for youngsters, parents, teachers and anyone interested in learning more about the Sun. YPOP utilizes a number of approaches to the dissemination of solar data which incorporates elements of both formal education, via a number of lesson plans and classroom activities, and informal education, via access to the latest solar images, a solar tour, and updated movies. This combination has proved extremely effective in providing quality access to scientific data for a broad audience with a wide range of interests. The Yohkoh Public Outreach Project can be found at <http://www.LMSAL.com/YPOP>.

## ED12A-0161 1330h POSTER

**Partnerships for Creating Learning Resources Fostering Discovery and Dissemination**

Martin Ruzek<sup>1</sup> (920-732-3316; [ruzek@usra.edu](mailto:ruzek@usra.edu))

Donald R. Johnson<sup>2</sup> (608-262-2538; [donj@ssc.wisc.edu](mailto:donj@ssc.wisc.edu))

<sup>1</sup>Universities Space Research Association, 8426 Polifka Rd, Whitelaw, WI 54247, United States

<sup>2</sup>Universities Space Research Association, SSEC 1225 W. Dayton, Madison, WI 53706, United States